

INJURY BIOMECHANICS RESEARCH
Proceedings of the Eleventh International Workshop

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
AUTOPSY REPORTING PROCEDURE

13 October 1983

by

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CADAVER IMPACT TEST

AUTOPSY PROCEDURE

October 13, 1983

Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C.

This document contains instructions and a set of forms for cadaver impact test autopsy reporting as required by the National Highway Traffic Safety Administration (NHTSA). The objective is to provide NHTSA with test specification and measurement data in a standard format for each impact test conducted.

Forms are provided for collecting test specification data. There is a set of forms for each of the following:

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General Test Information	1
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The forms are fairly self-explanatory. They are, however, accompanied by numerous illustrations to assist in completing entries.

Codes are included on the forms wherever possible. All that is required is to check the appropriate one. If none of the codes seem applicable, please contact NHTSA (Mr. Richard Morgan, 202/426-4875) for clarification or additional information.

GENERAL TEST INFORMATION

STUDY TITLE _____

LABORATORY: _____ CONTRACT NO. : _____
TEST DATE: _____ TEST NO.: _____ VELOCITY: _____ MPH

_____ M/S

TEST TYPE

One of the following codes will be used to indicate the test type:
(please check the appropriate choice)

____ BAS - Baseline test of conventional vehicle (s)
____ CAN - Cannon Test
____ MOD - Test of vehicle containing structural and/or interior modifications
____ PED - Pedestrian Test
____ PEN - Pendulum Test
____ RWS - Real World Simulation
____ SLD - Sled Test
____ OTH - Other _____

Test Objective:

Restraint System 1:

This refers to the primary restraint system of the test conditions. Choose the code which represents that system for this test.

____ ABG - Air bag
____ APR - APR Padding
____ CHD - Child restraint
____ FIB - Fiberglass padding
____ LAP - Lap belt only
____ MCI - Minicars padding
____ PAS - Passive belt system
____ RIG - Rigid wall
____ STC - Steering column
____ 3PT - Three point belt
____ INS - Instrument panel
____ OTH - Other (describe in restraint system text)

Restraint System 2:

This refers to the secondary restraint system of the test. The codes available are the same as for Restraint System 1. Please check the appropriate choice.

- ☐ ABG - Air bag
- ☐ APR - APR Padding
- ☐ CHD - Child restraint
- ☐ FIB - Fiberglass padding
- ☐ LAP - Lap belt only
- ☐ MCI - Minicars padding
- ☐ PAS - Passive belt system
- ☐ RIG - Rigid wall
- ☐ STC - Steering column
- ☐ 3PT - Three point belt
- ☐ INS - Instrumental panel
- ☐ OTH - Other (describe in restraint system text)

Restraint System Text:

General Test Information

The Study Title will have up to 80 characters. If under a contract, please specify contract title.

Contract Number will be required only if applicable.

Human Subject Information

ANOMALY:

This variable does not apply to the instrumentation. Rather this variable will represent any thing other than instrumentation, which merits special attention by the researchers who will subsequently use this data.

Examples are:

- Abnormally thin heart wall according to opinion of physician performing the autopsy.
- Injuries as a result of instrumentation placement, i.e. - broken rib where accelerometer was mounted.

This anthropometry format was developed for the purpose of assuring that the measures made by each laboratory are made from the same reference points. The chosen measures reflect the requirements for entry of the subject into the 3-dimensional Crash Victim Simulation model. Should there be a need to model the particular crash test in which that subject was exposed, the dimensions would be available.

HUMAN SUBJECT INFORMATION

CADAVER NO.: _____ DURATION OF BED CONFINEMENT _____
AGE: _____ SEX: _____ CAUSE OF DEATH: _____
PHYSICAL APPEARANCE: _____ DATE OF DEATH: _____

ANOMALY: _____

ANTHROPOMETRY

0 - Weight* _____
1 - Stature* _____
2 - Shoulder(acromial) Height. _____
3 - Scye (armpit-shoulder)Circumference. _____
4 - Waist Height _____
5 - Seated Height*** _____
6 - Head Length _____
7 - Head Breadth _____
8 - Head to Chin Height(Apex to Mentum). _____
9 - Neck Circumference _____
10 - Shoulder Breadth (Biacromial Breadth). _____
11 - Chest Depth. _____
12 - Chest Circumference. _____
13 - Chest Breadth. _____
14 - Interscye _____

Note: * weight in pounds

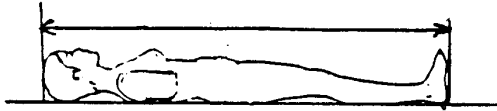
** lengths in inches

*** measures 5, 27, 31 must be made in cases where the subject will be
be used in the seated position during tests. In all other cases
enter 9999 when under these measures.

LABORATORY _____ TEST NO. _____

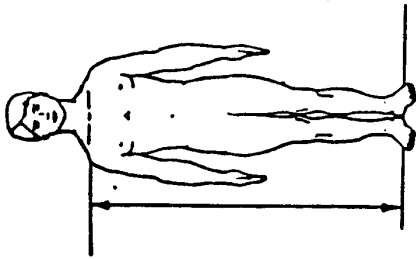
- 15 - Waist Depth
16 - Waist Breadth
17 - Waist Circumference
18 - Buttock Depth
19 - Buttock Circumference
20 - Hip Breadth
21 - Shoulder to Elbow Length (Acromion-Radiale length).
22 - Forearm-hand Length (elbow-middle finger)
23 - Biceps Circumference
24 - Elbow Circumference
25 - Forearm Circumference
26 - Wrist Circumference
27 - Knee Height (seated) ***
28 - Tibiale Height
29 - Thigh Circumference
30 - Lower Thigh Circumference (leg flexed 90°) ***
31 - Knee Circumference (leg flexed 90°) ***
31 - Knee Circumference (leg extended)
32 - Calf Circumference
33 - Ankle Circumference
34 - Ankle Height (outside)(lateral malleous).
35 - Foot Breadth
36 - Foot Length
37 - Top of Head to Trochanterion Length

LABORATORY _____ TEST NO. _____



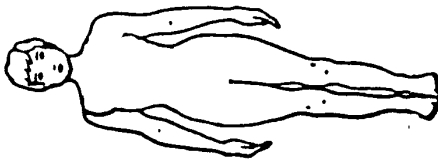
1. STATURE

Cadaver supine with its head oriented in the Frankfort plane (relative) and firmly touching the headboard of the measuring table. Using an anthropometer, measure the horizontal distance from the headboard to the most distal portion of the heel. The distance to both the right and left heels is measured and the two values averaged.



2. SHOULDER (ACROMIAL) HEIGHT

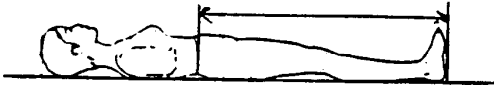
The horizontal distance from the most distal portion of the heel to the most lateral point of the acromial process of the scapula. The measurement may be obtained by measuring either 1) the distance to both the right and left heels and the two values averaged or 2) the distance from the vertex of the head to the acromial process and the value subtracted from the stature.



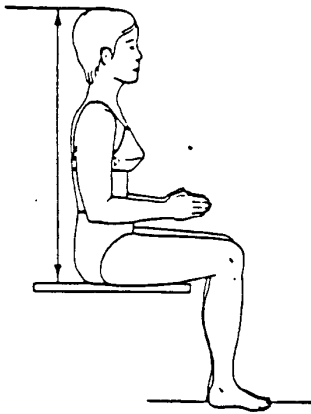
3. SCYE CIRCUMFERENCE

The circumference of the scye, passing through the axilla over the anterior and posterior vertical scye landmarks and over the acromial landmarks.

4. WAIST HEIGHT

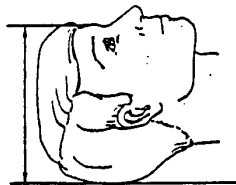


The horizontal distance from the most distal portion of the heel to the waist landmark. The measurement may be obtained by measuring either 1) the distance to both the right and left heels and the two values averaged or 2) the distance from the vertex of the head to the waist landmark and the value subtracted from the stature.



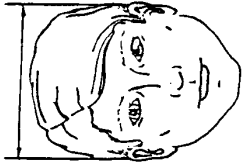
5. SEATED HEIGHT *

The vertical distance from the sitting surface to the top of the head. The subject sits erect, facing straight ahead.



6. HEAD LENGTH

The maximum length of the head between the glabella and the occiput in the midsagittal plane.



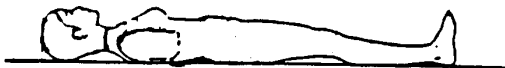
7. HEAD BREADTH

The maximum horizontal breadth of the head above the level of the ears.



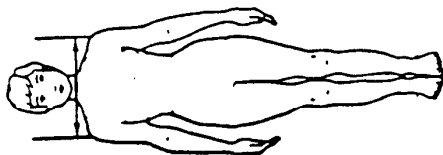
8. HEAD HEIGHT (APEX-MENTUM)

The distance from the highest point on the head to the menton landmark.



9. NECK CIRCUMFERENCE

With a tape in a plane perpendicular to the axis of the neck and passing over the laryngeal prominence (Adam's Apple), measure the circumference of the neck.



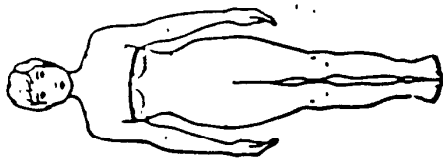
10. SHOULDER (BIACROMIAL) BREADTH

The horizontal distance across the body between the acromial landmarks.



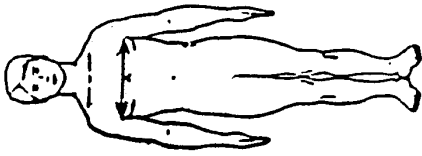
11. CHEST DEPTH

Using an anthropometer, measure the vertical distance from the measuring table to the anterior surface of the body at the axilla. Repeat the same procedure a second time, but measure at the substernale. The average of these two values will be the approximate chest depth.



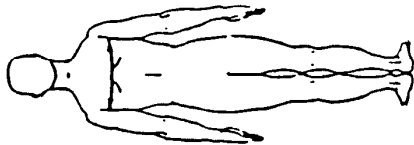
12. CHEST CIRCUMFERENCE

With a tape at the level of the axilla and perpendicular to the long axis of the trunk measure the axilla circumference. Repeat the same procedure a second time, but measure at the substernale to obtain the substernale circumference. The average of these two values will be the approximate chest circumference.



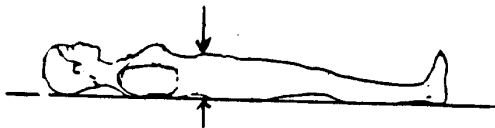
13. CHEST BREADTH

Using a beam caliper, measure the horizontal breadth of the chest at the level of the axilla. Repeat the same measurement at the level of the substernale. The average of these two values will be the approximate chest breadth.



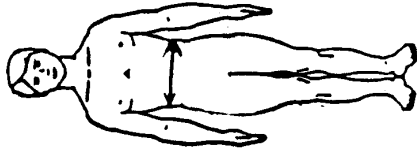
14. INTERSCYE

The horizontal distance across the back between the posterior scye point landmarks.



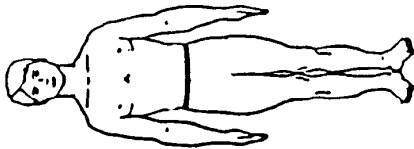
15. WAIST DEPTH

Using an anthropometer, measure the vertical distance between the measuring table and the anterior surface of the body at the level of the omphalion.



16. WAIST BREADTH

Using a beam caliper, measure the horizontal breadth of the body at the level of the omphalion.



17. WAIST CIRCUMFERENCE

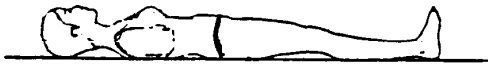
With a tape passing over the umbilicus and perpendicular to the long axis of the trunk, measure the circumference of the waist.



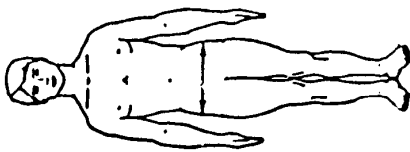
18. BUTTOCK DEPTH

The anterior-posterior distance on the medial plane projection at the level of the maximum posterior protrusion of the buttocks.

19. BUTTOCK CIRCUMFERENCE

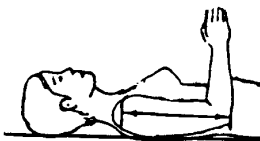


With a tape passing over the greatest lateral protrusion of the hips, and in a plane perpendicular to the long axis of the trunk, measure the circumference of the hips.



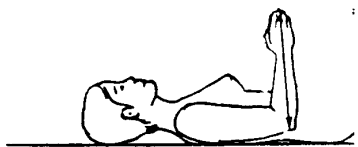
20. HIP BREADTH

Using a beam caliper, measure the horizontal distance across the greatest lateral protrusion of the hips.



21. SHOULDER-ELBOW LENGTH

Flex arm 90° and with beam caliper measure the distance from the top of the acromion process to the bottom of the elbow.



22. FOREARM-HAND LENGTH

With arm flexed 90° with beam caliper measure the distance from the tip of the elbow to the tip of the longest finger.



23. BICEPS CIRCUMFERENCE

With a tape perpendicular to the long axis of the upper arm, measure the circumference of the upper arm at the level of the maximum anterior prominence of the biceps brachii.



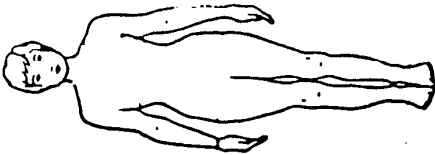
24. ELBOW CIRCUMFERENCE

The elbows of the cadaver were flexed to about 125° ($\bar{X}=125^{\circ}$; S.D.= 16°). With a tape passing over the olecranon process of the ulna and into the crease of the elbow, measure the circumference of the elbow.



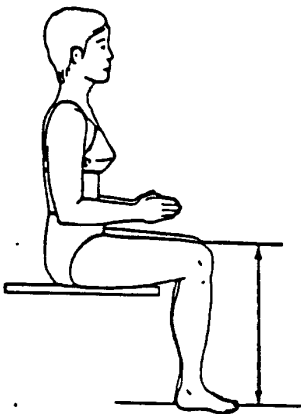
25. FOREARM CIRCUMFERENCE

With a tape perpendicular to the long axis of the forearm, measure the maximum circumference of the forearm.



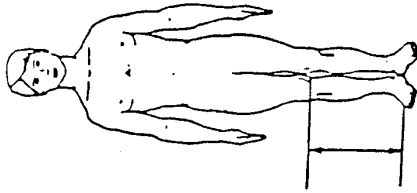
26. WRIST CIRCUMFERENCE

With a tape perpendicular to the long axis of the forearm, measure the minimum circumference of the wrist proximal to the radial and ulnar styloid processes.



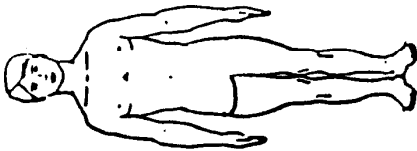
27. KNEE HEIGHT, SEATED *

The vertical distance from the floor to the uppermost point on the knee. The subject is seated erect with knees and ankles at right angles.



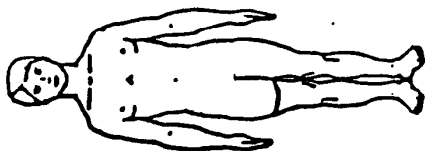
28. TIBIALE HEIGHT

The horizontal distance from the most distal portion of the heel to the proximal medial margin of the tibia. The measurement may be obtained by measuring either: 1) the distance to both the right and left heels and the two values averaged or 2) the distance from the vertex of the head to the proximal medial margin of the tibia and the value subtracted from the stature.



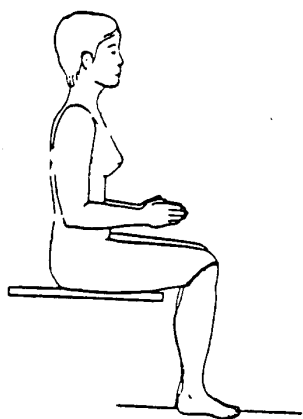
29. THIGH CIRCUMFERENCE

With a tape perpendicular to the long axis of the leg and passing just below the lowest point of the gluteal furrow, measure the circumference of the thigh.



30. LOWER THIGH CIRCUMFERENCE

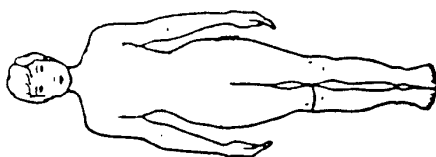
With a tape passing just superior to the patella and perpendicular to the long axis of the leg, measure the circumference of the lower thigh.



31. KNEE CIRCUMFERENCE (leg flexed 90°) *

Use steel tape to measure the circumference of the knee across the antecubital crease and the most anterior-superior margin of the patella.

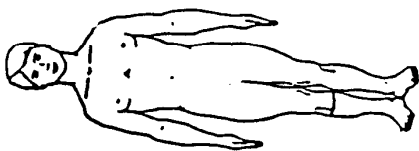
1. Only one measurement of knee circumference is required. In the case where the subject is used in the seated position during the test measure knee circumference (leg flexed 90°). In all other cases enter 9999 under this measure.



KNEE CIRCUMFERENCE (leg extended)

The circumference of the knee at the level of the midpatella landmark.

2. When the subject is used in the seated position measure the knee circumference with leg flexed and enter 9999 under this measure. In all other cases enter knee circumference with the leg extended.



32. CALF CIRCUMFERENCE

With a tape perpendicular to the long axis of the lower leg, measure the maximum circumference of the calf.



33. ANKLE CIRCUMFERENCE

With a tape perpendicular to the long axis of the lower leg, measure the minimum circumference of the ankle.



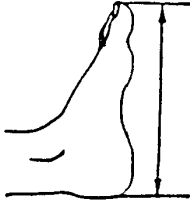
34. ANKLE HEIGHT

The distance from the most distal portion of the heel to the level of the minimum circumference of the ankle.



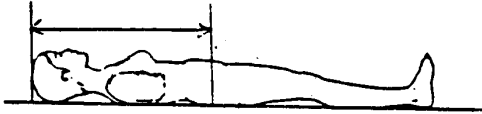
35. FOOT BREADTH

The maximum horizontal distance across the foot, at right angles to the long axis.



36. FOOT LENGTH

Using a beam caliper, measure the distance from the dorsal surface of the heel to the tip of the longest toe.



37. TOP OF HEAD TO TROCHANTERION LENGTH

Cadaver supine with its head oriented in the Frankfort plane (relative) and firmly touching the headboard of the measuring table. Using an anthropometer, measure the horizontal distance between the headboard and trochanterion.

* Note: Measures 5, 27, 31 must be made in cases where the subject will be used in the seated position during tests. In all other cases enter 9999 under these measures.

Anthropometry figures and definitions are adapted from:

Clauser, C.E., McConville, J.T. and Young, J.W., "Weight, Volume and Center of Mass of Segments of the Human Body", Report AMRL-TR-69-70 August 1969, Aerospace Medical Research Lab, Wright-Patterson A.F.B., Ohio.

also

NASA Reference Publication 1024
 Anthropometric Source Book
 Volume I: Anthropometry for Designers

General Injury Information

- 1) Injuries will be coded according to the AIS-80 edition of the American Association of Automotive Medicine manual. A Injury Description Sample is shown in Fig. 1. Tables 1,2, and 3 give a summary of the injury codes.

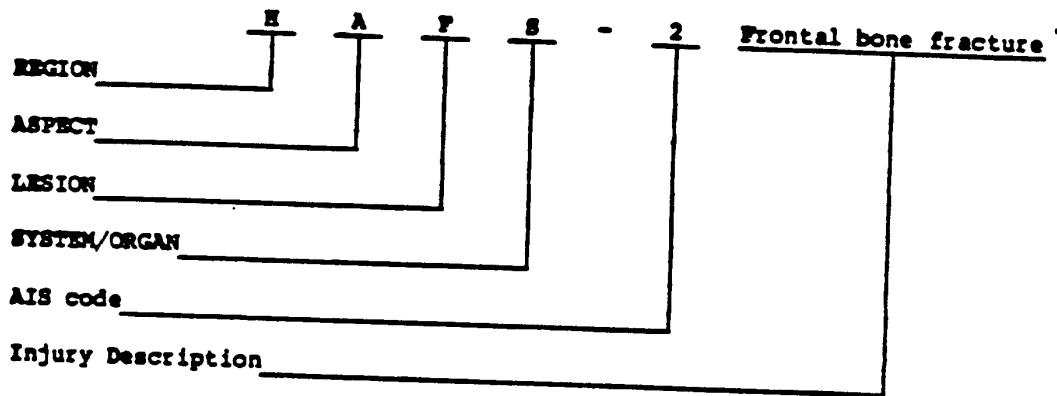


Fig. 1 - OIC-AIS Injury Description Sample

Table 1. Abbreviated Injury Scale (AIS)

<u>Code</u>	<u>Description</u>
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Maximum injury—unsurvivable in 1980
7	Injured, unknown severity
9	Unknown if injured

Table 2. Occupant Injury Classification (OIC)

I. BODY REGION			
H	Head (Bony Skull, Brain, Scalp, Ears)		
F	Face (Forehead, Nose, Eyes, Mouth)		
N	Neck (Cervical Spine, C ₁ -C ₇)		
S	Shoulder (Clavical, Scapula, Joint)		
X	Upper Extremity (Whole limb, or unspecified which part of upper limb)		
A	Arm (Upper)		
E	Elbow		
R	Forearm		
W	Wrist-Hand (Fingers)		
B	Back (Thoraco-Lumbar Spine, T ₁ -T ₁₂ , L ₁ -L ₅)		
C	Chest (Anterior and Posterior Ribs)		
M	Abdomen (Diaphragm and Below)		
P	Pelvis-Hip (includes Coccyx and Sacrum)		
Y	Lower Extremity (Whole limb, or unspecified which part of lower limb)		
T	Thigh (Femur)		
K	Knee		
L	Leg (Below Knee)		
Q	Ankle-Foot (Toes)		
O	Whole Body		
U	Unknown Region		
II. ASPECT		IV. SYSTEM/ORGAN	
R	Right	A	Arteries, Veins
L	Left	B	Brain
C	Central	C	Spinal Cord
A	Anterior/Front	D	Digestive (Stomach, Colon, Pancreas,
P	Posterior/Back	E	Ears Biliary Tract)
S	Superior/Upper	G	Urogenital
I	Inferior/Lower	H	Heart
W	Whole Region	I	Integumentary
U	Unknown Aspect	J	Joints
III. LESION		K	Kidneys
A	Abrasion	L	Liver
B	Burn	M	Muscles
C	Contusion	N	Nervous system
D	Dislocation	O	Eye
E	Severence, Transection	P	Pulmonary, Lungs
F	Fracture	Q	Spleen
G	Detachment, Separation	R	Respiratory (Larynx, Trachea, Pharynx,
K	Concussion	S	Skeletal Diaphragm)
L	Laceration	T	Thyroid, other Endocrine glands
M	Amputation	V	Vertebrae
N	Crush	W	All systems in region
P	Porforation, Puncture	U	Injured, unknown systems or organs
R	Rupture		
S	Sprain		
T	Strain		
V	Avulsion		
O	Other		
U	Unknown lesion		
Z	Fracture and dislocation		

- 2) Hemorrhages represent results of injuries and are not injuries per se: therefore should not be coded. Probably the investigator wants to indicate abrasion, contusion, laceration, or strain.

- 3) In reference to Aspect, the definition is as follows:

Aspect refers to that part of the O.I.C.
Body Region where the injury occurred.

Aspect is not be used in reference with the individual organ. An example of the use of Aspect is as follows.

Injury - a laceration on the right side of
the liver. The Aspect would not be coded right (R)
referring to where the laceration is on the liver.
The Aspect would be coded left (L) which refers to
the position of the liver in the body.

Rib fractures will be coded as right (R) or left (L).

- 4) If a Lesion involves more than one Aspect of a Body Region:
 - i) Determine the predominate aspects, and code it as that aspect.
 - ii) If unable to determine aspect, use aspect code W (whole).
- 5) Note that the maximum number of fractured ribs is 24.
- 6) The General Injury Information section is a short, concise report of the injuries for the purpose of computer coding. It generally follows existing practice of accident investigation teams. This section is not intended to be, nor is it, an exhaustive, complete report of the injuries. The collection of indepth information is served by the Detailed Injury Information section.

GENERAL INJURY INFORMATION

NFR (Number of fractured ribs) _____
 NRF (Number of rib fractures) _____

	<u>O.I.C.</u> <u>Body</u> <u>Region</u>	<u>Aspect</u>	<u>Lesion</u>	<u>System/</u> <u>Organ</u>	<u>A.I.S.</u> <u>Severity</u>
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____
9	_____	_____	_____	_____	_____
10	_____	_____	_____	_____	_____

TEXT OF INJURY*:

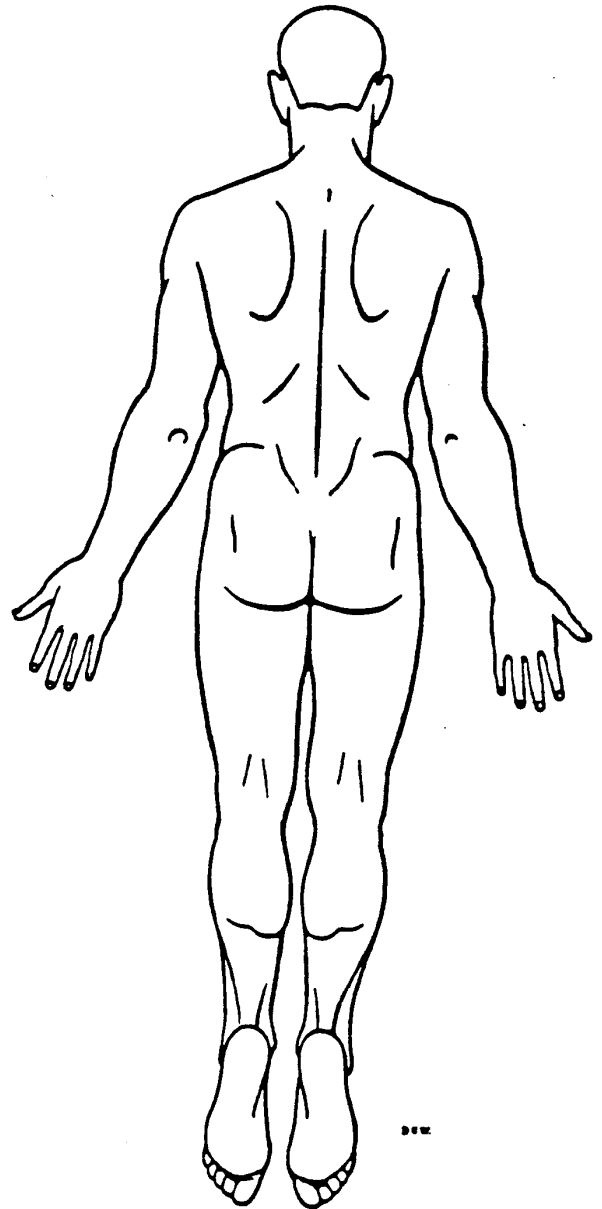
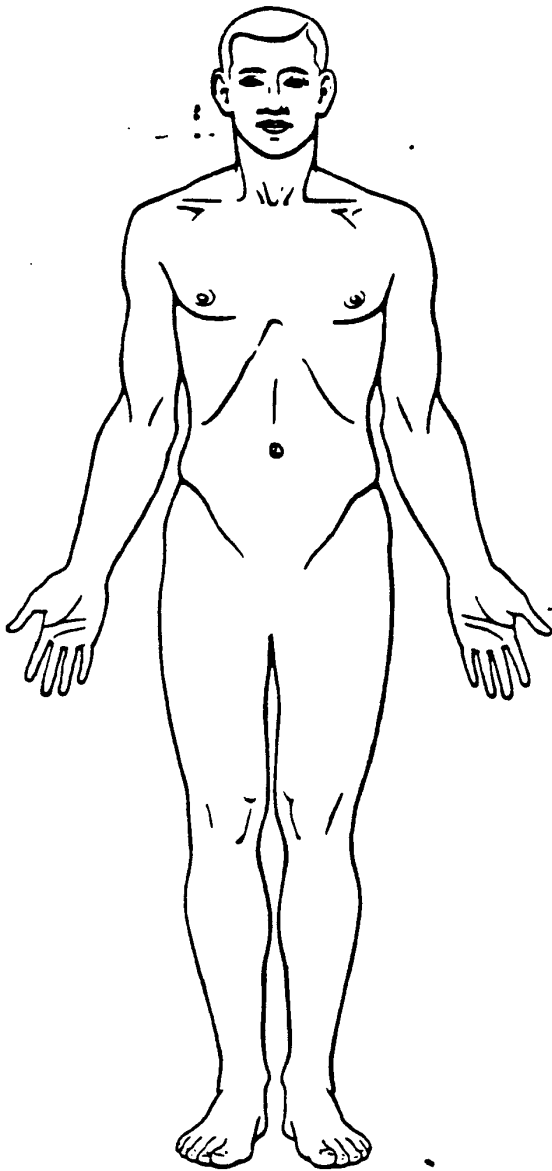
- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____
- 9 _____
- 10 _____

NOTE: * -Up to 80 characters of text

Detailed Injury Information

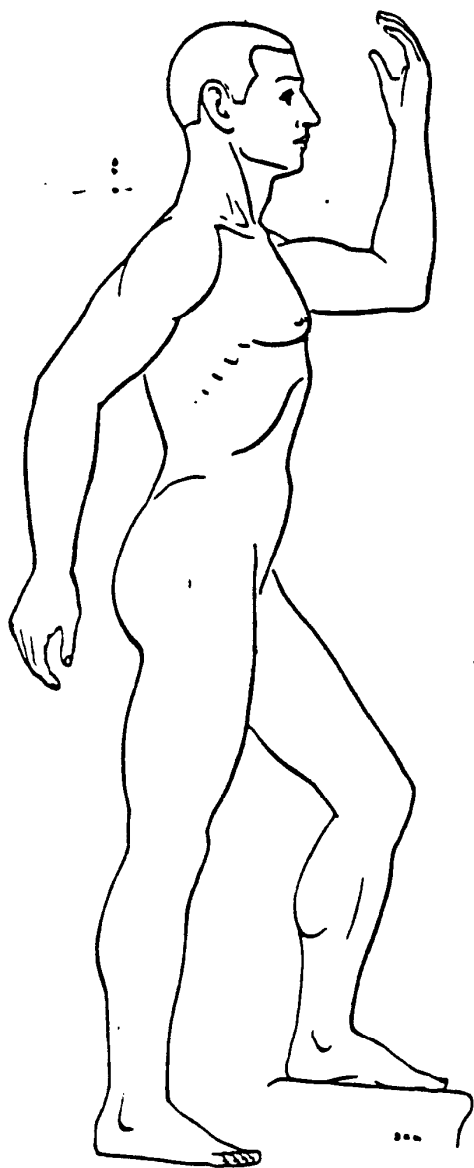
The figures of the Detailed Injury Information are provided to more completely describe the observed lesions. If there is no trauma associated with a particular figure, the figure should not be used.

If a written transcript or documentary photographs of the autopsy are readily available, please attach them to the Detailed Injury Information as supplementary material.



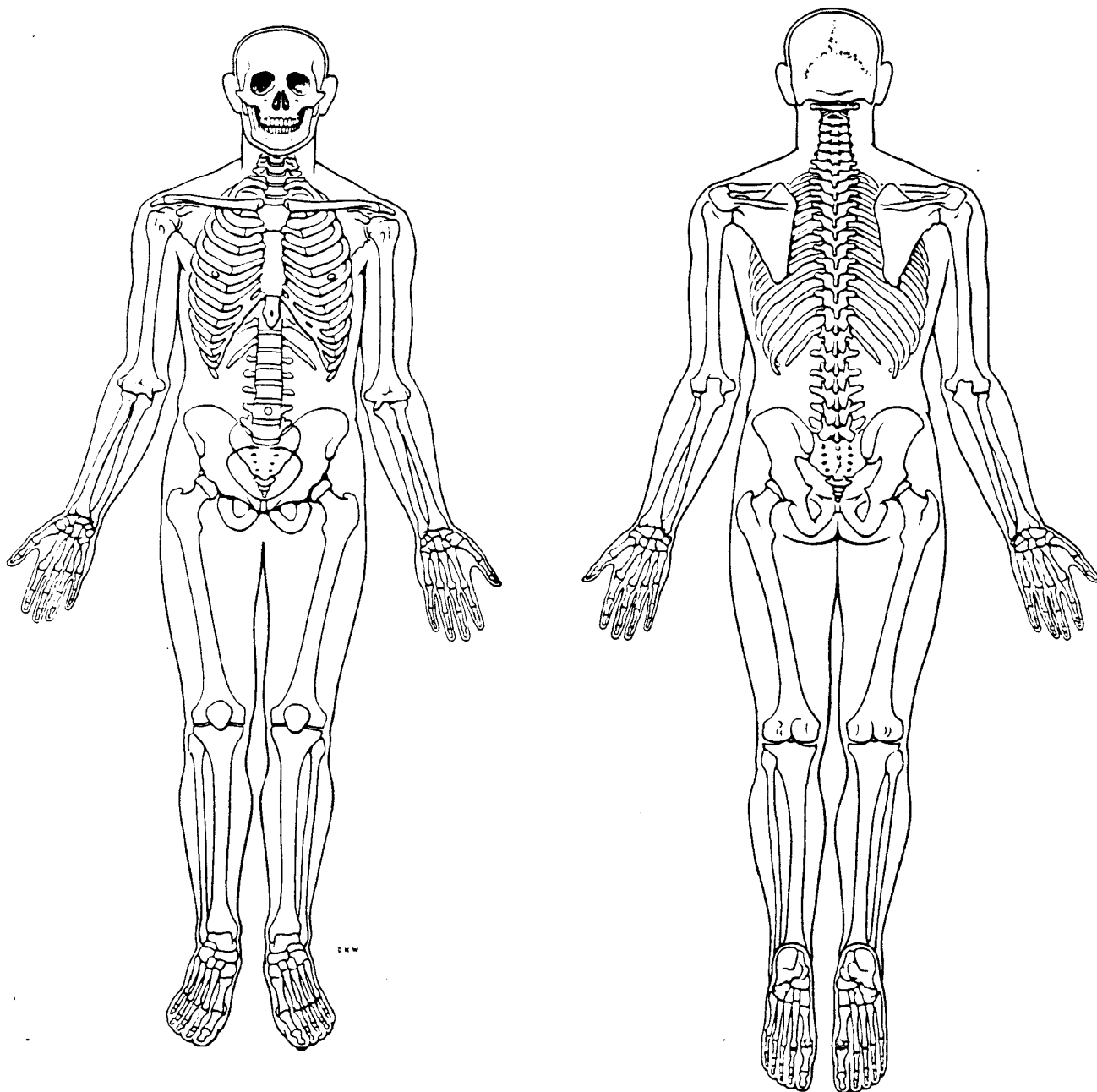
LABORATORY: _____

TEST # _____



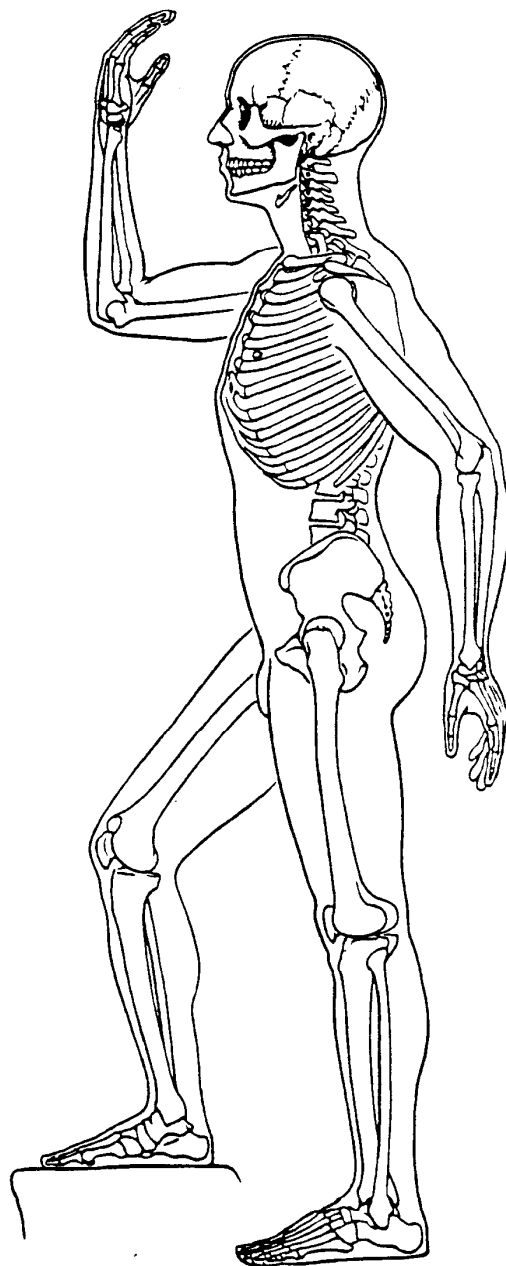
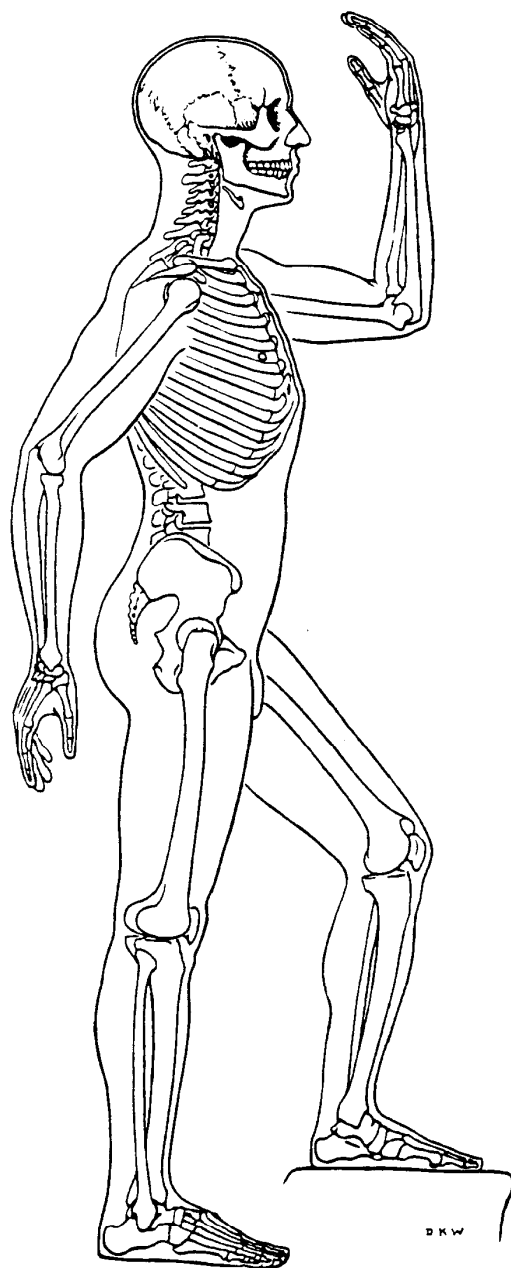
LABORATORY: _____

TEST # _____



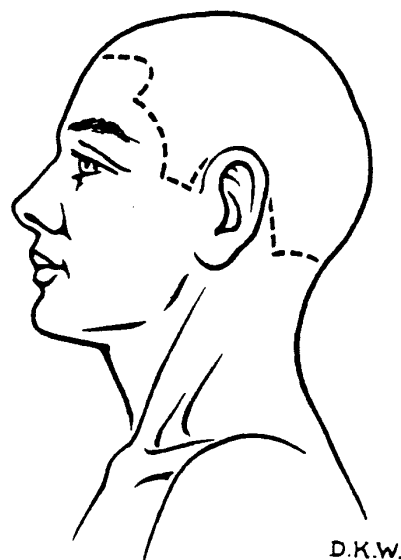
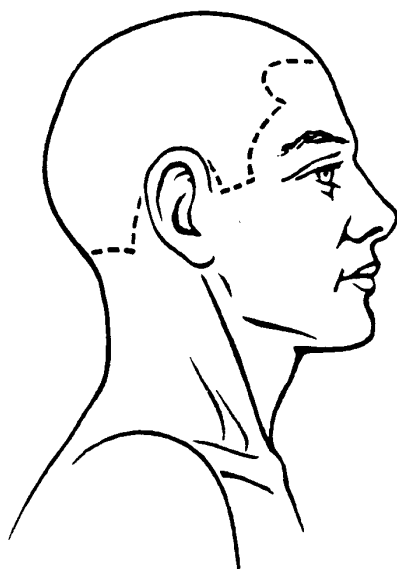
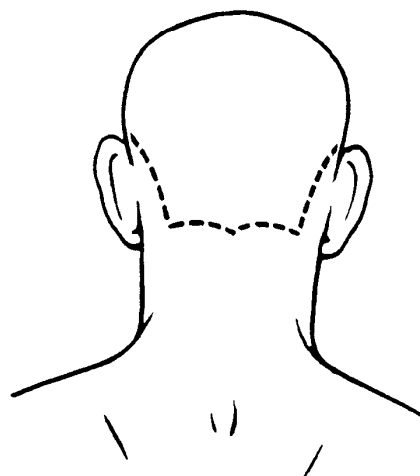
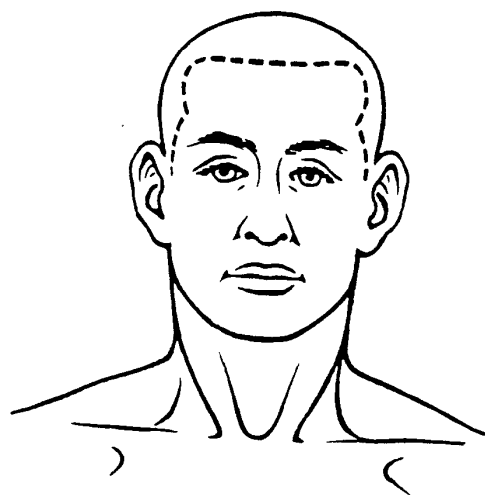
LABORATORY _____

TEST # _____



LABORATORY _____

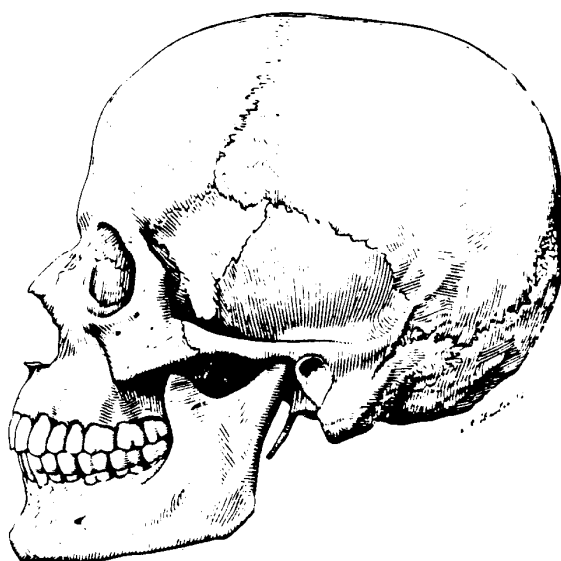
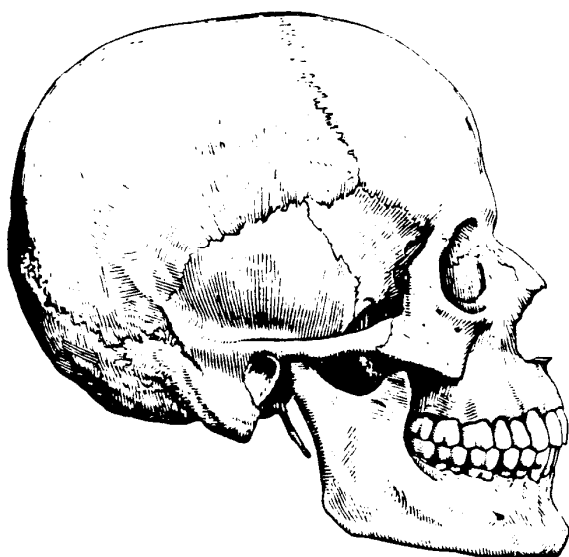
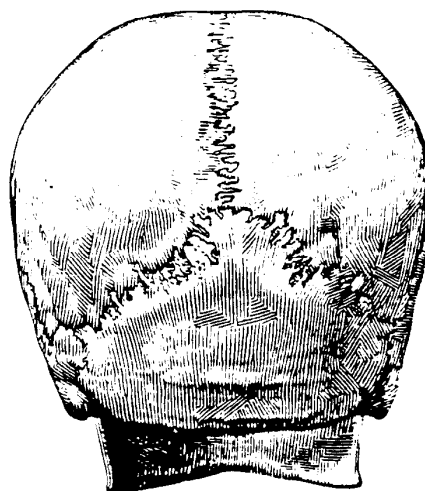
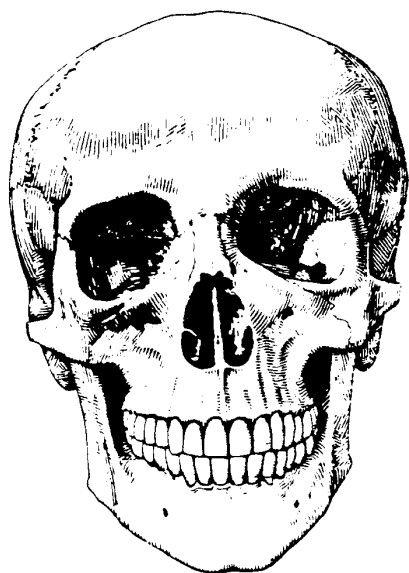
TEST # _____



D.K.W.

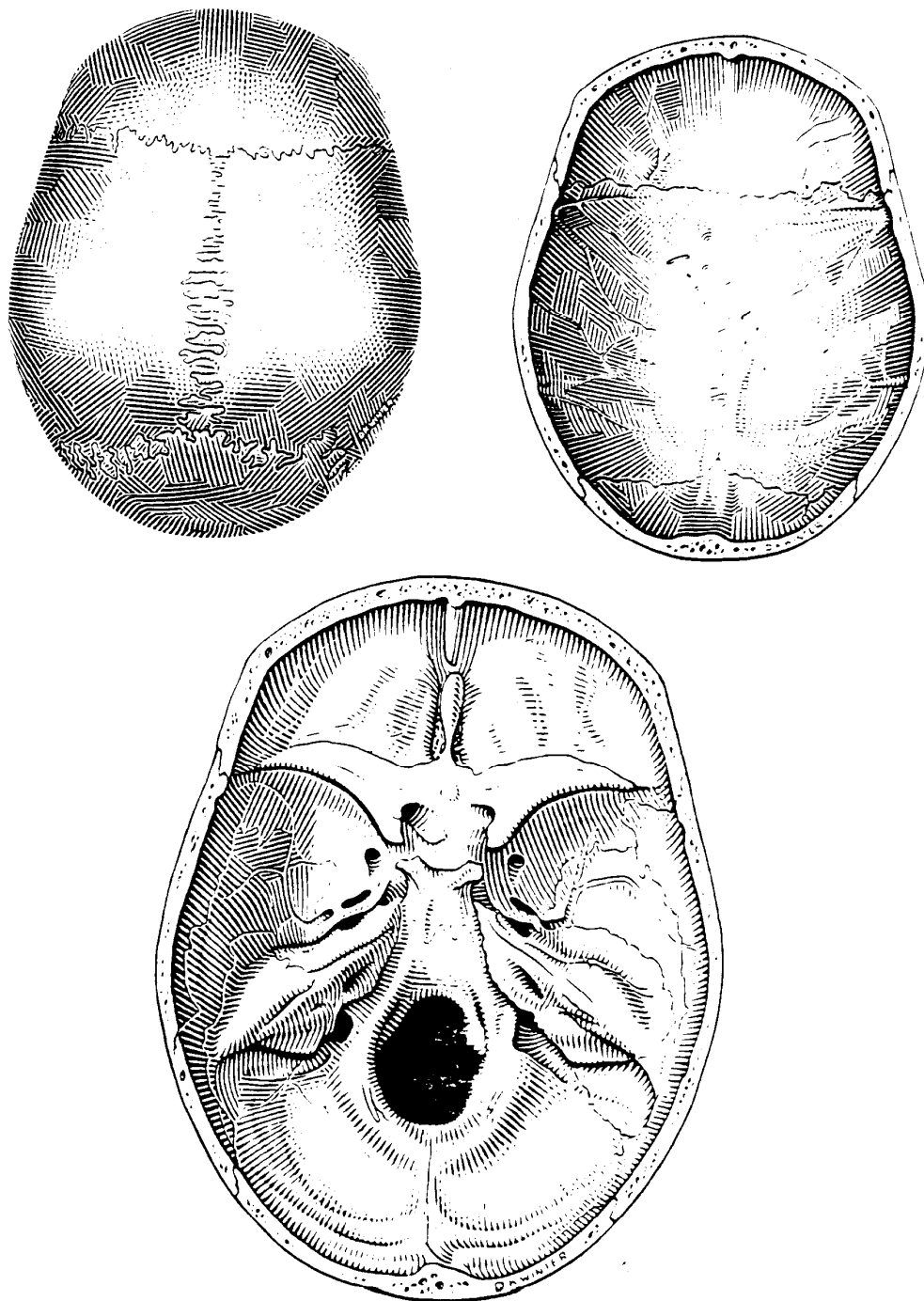
LABORATORY _____

TEST # _____



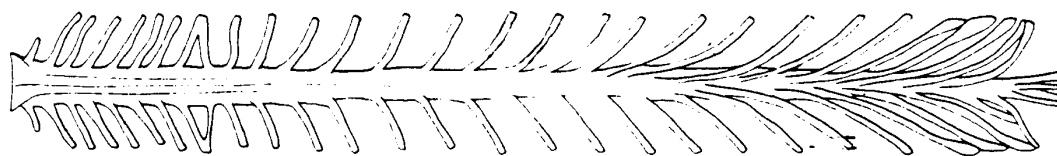
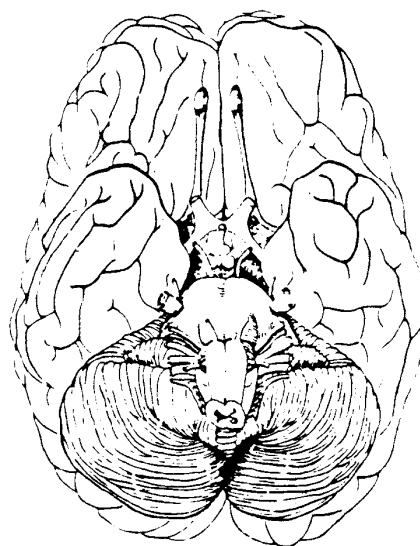
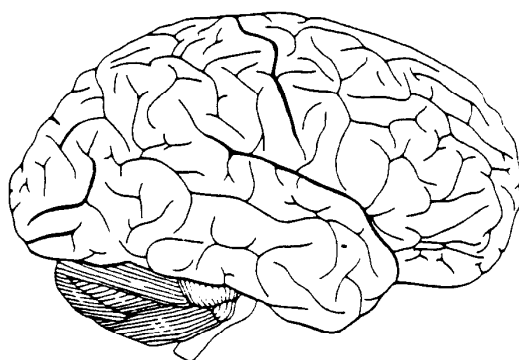
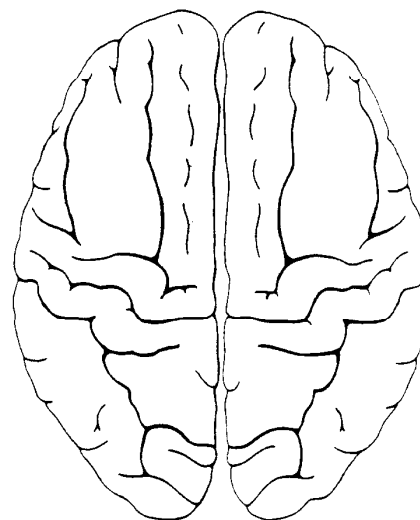
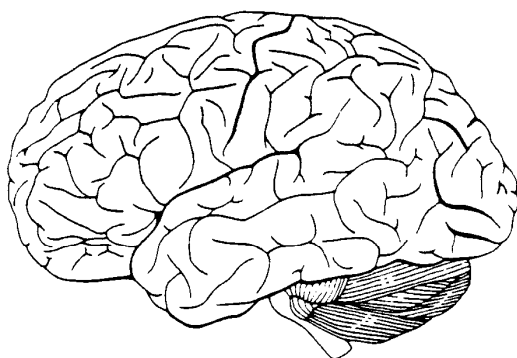
LABORATORY _____

TEST # _____



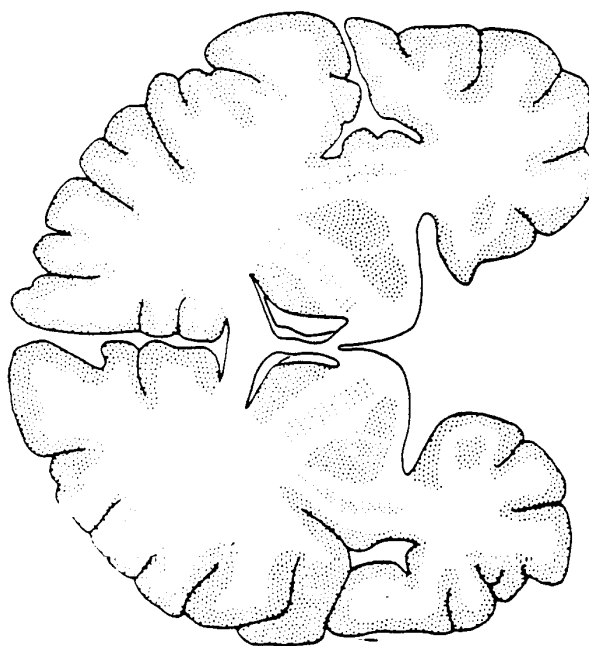
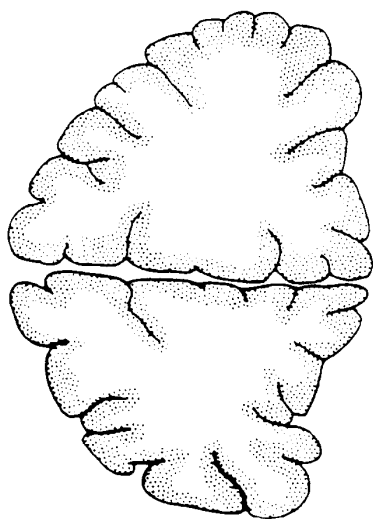
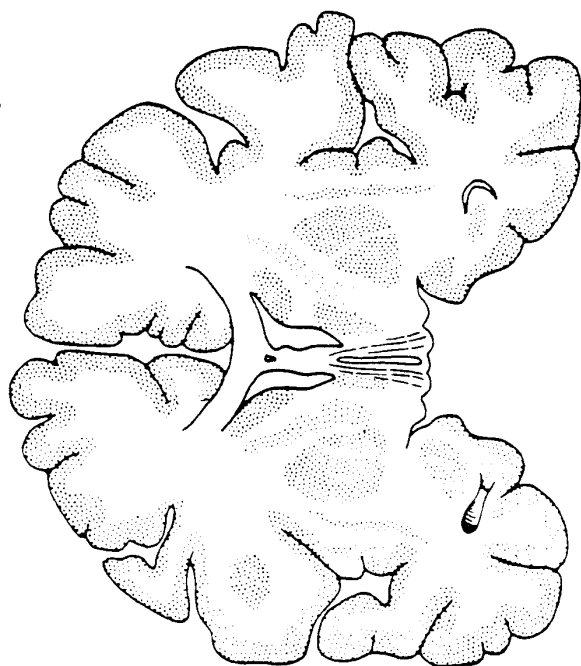
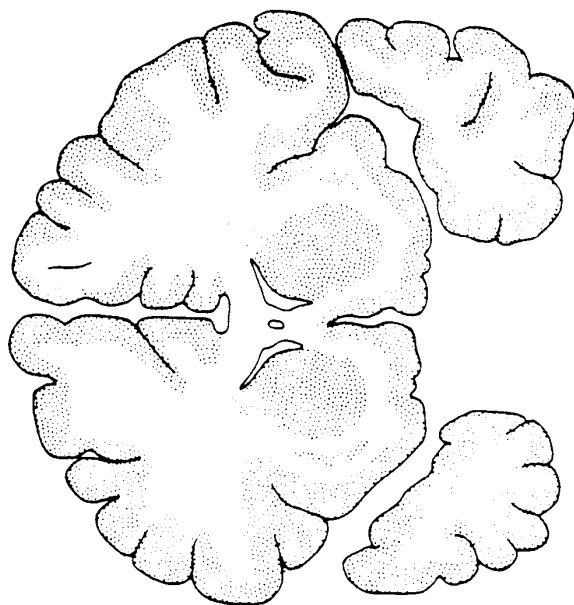
LABORATORY _____

TEST # _____



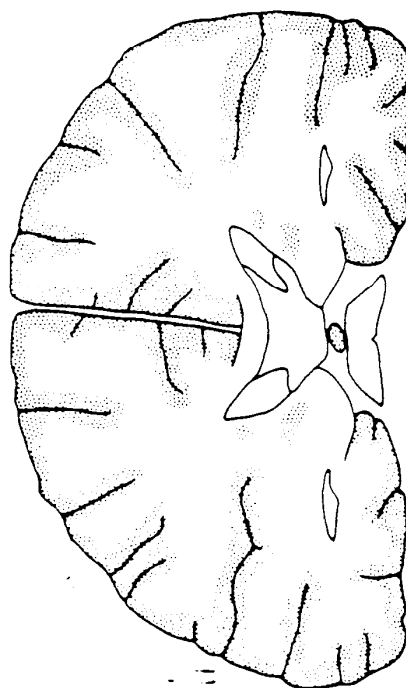
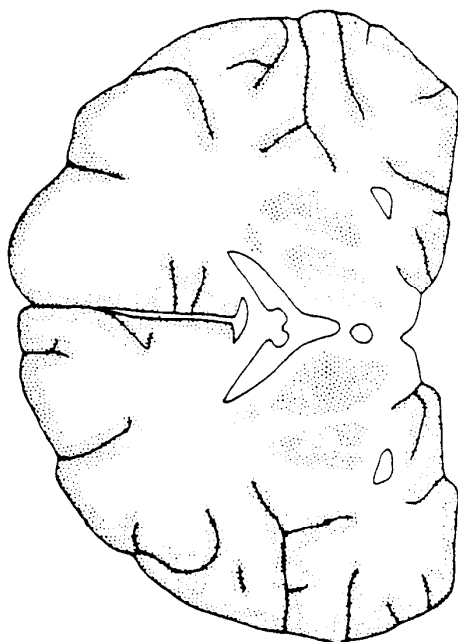
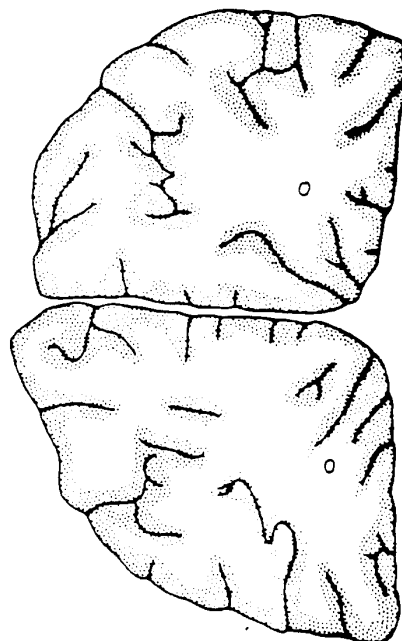
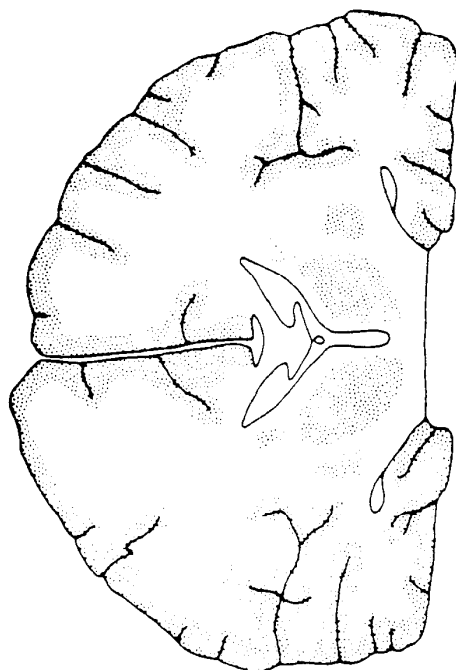
LABORATORY _____ 140

TEST # _____



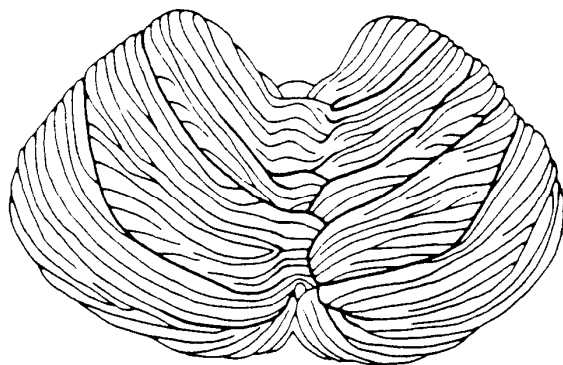
LABORATORY _____

TEST # _____

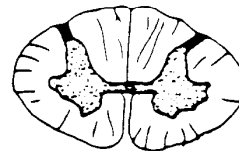


LABORATORY _____

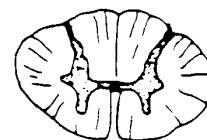
TEST # _____



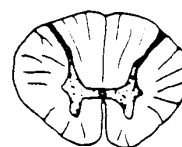
C5



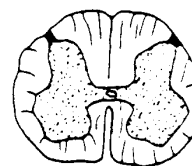
T2



T8



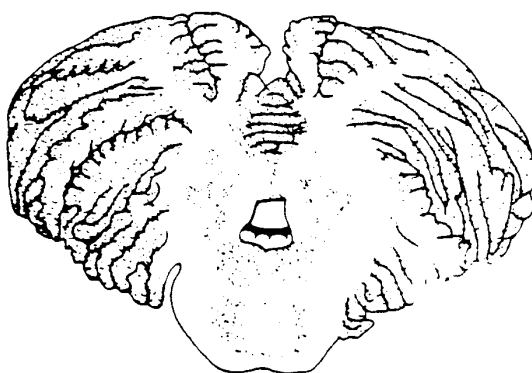
L3



S1

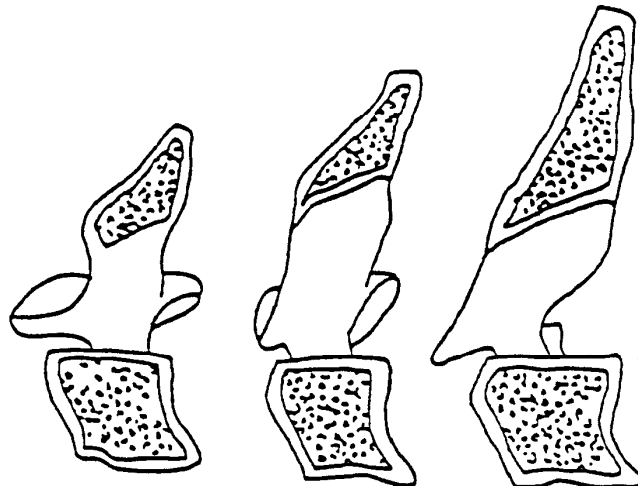


S3

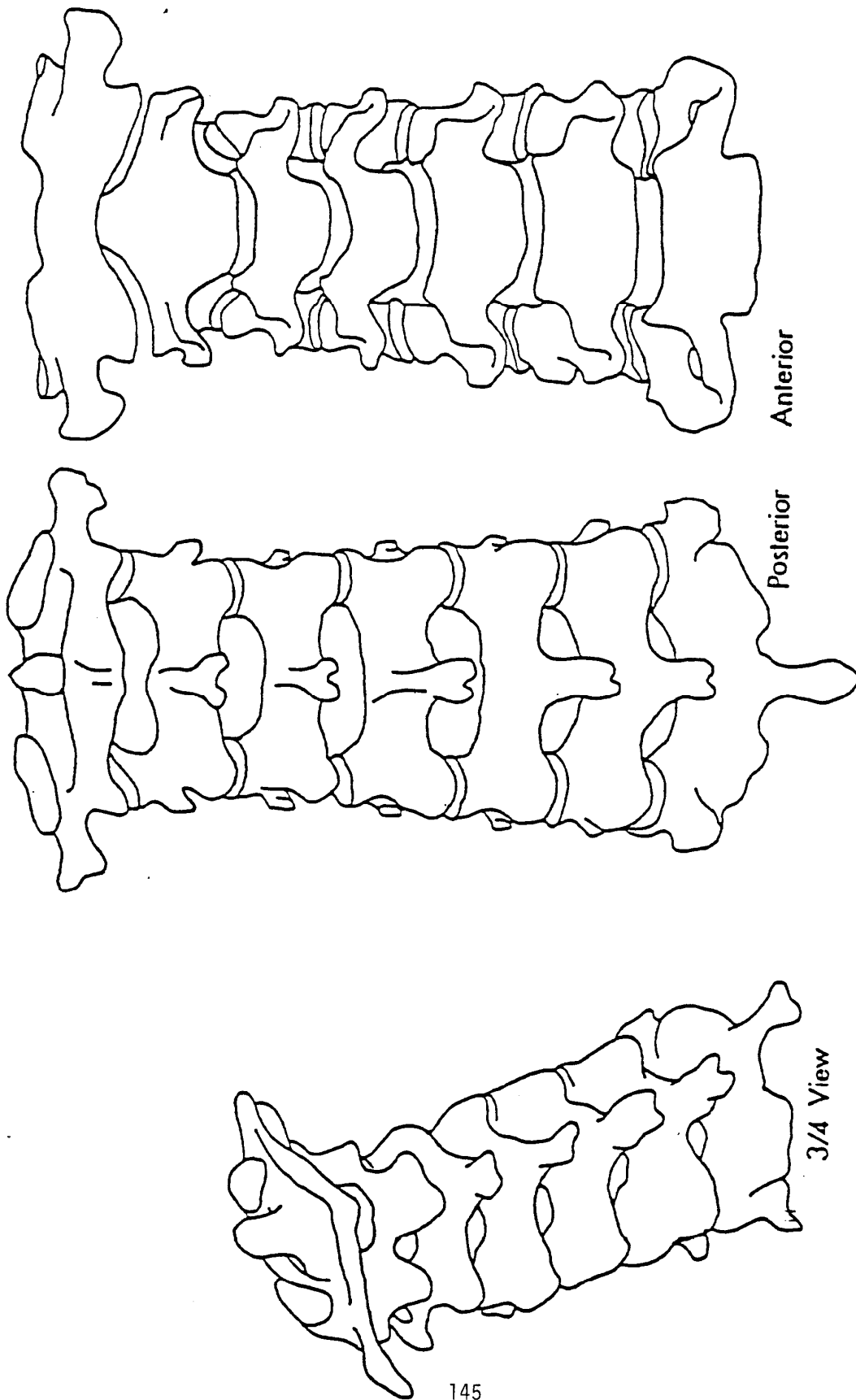




NHTSA AUT.REP REV 1



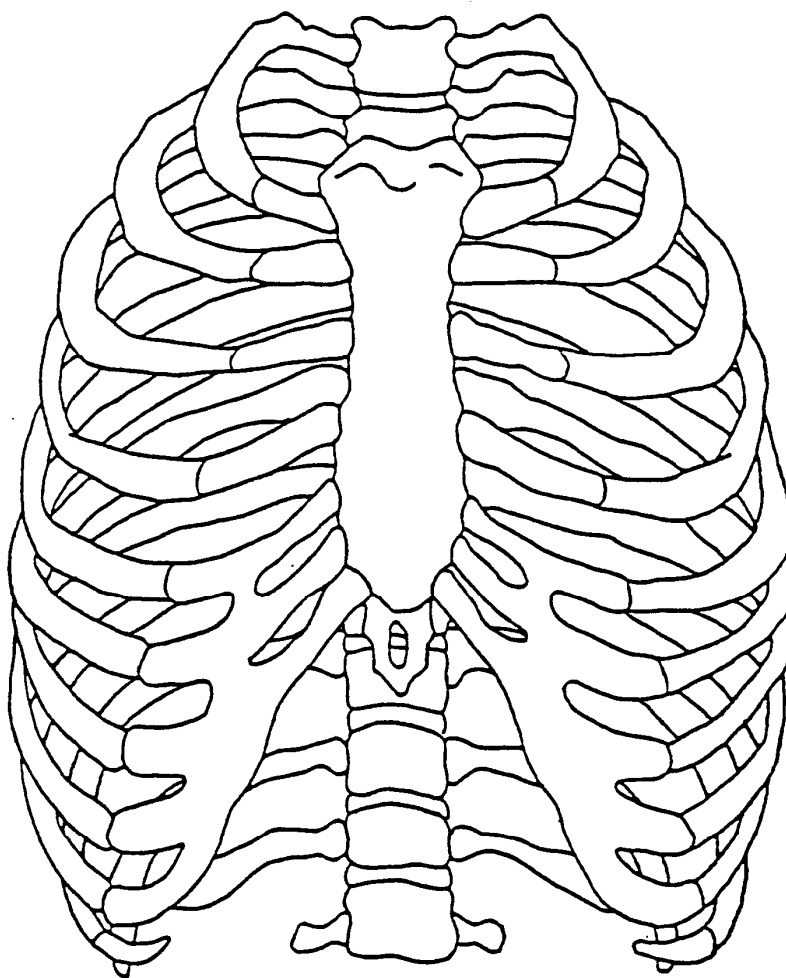
Cross Section



CERVICAL VERTEBRAE

LABORATORY

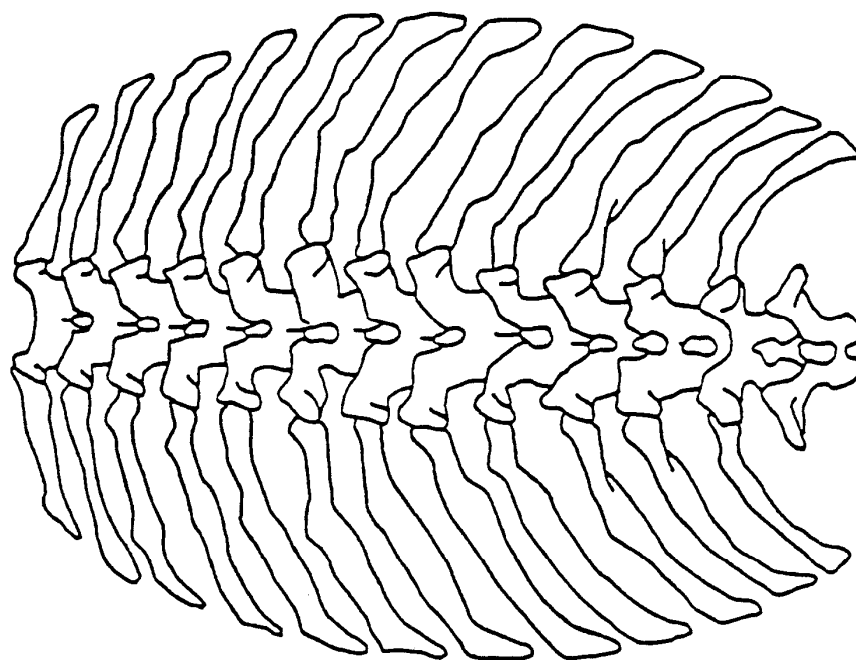
Test No.



ANTERIOR THORAX

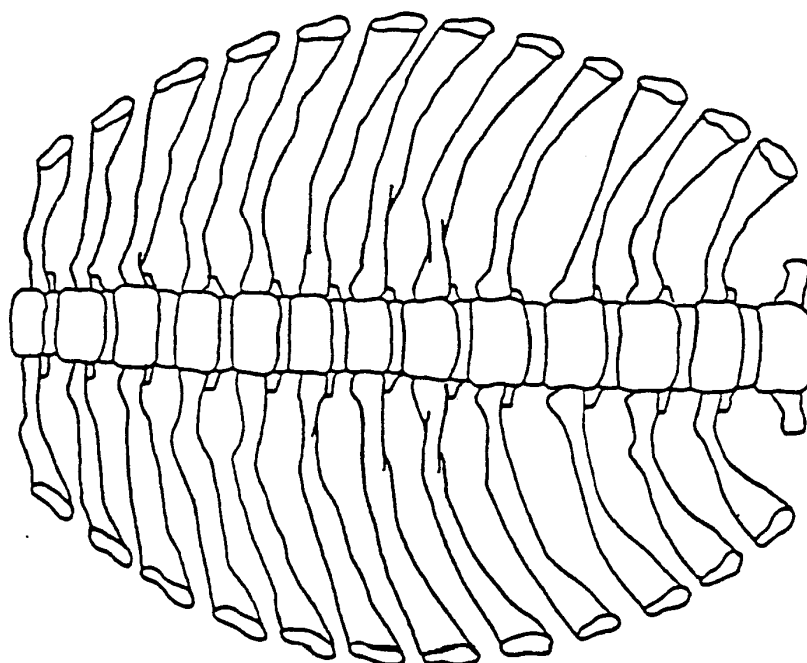
Test No. _____

LABORATORY _____



Posterior View

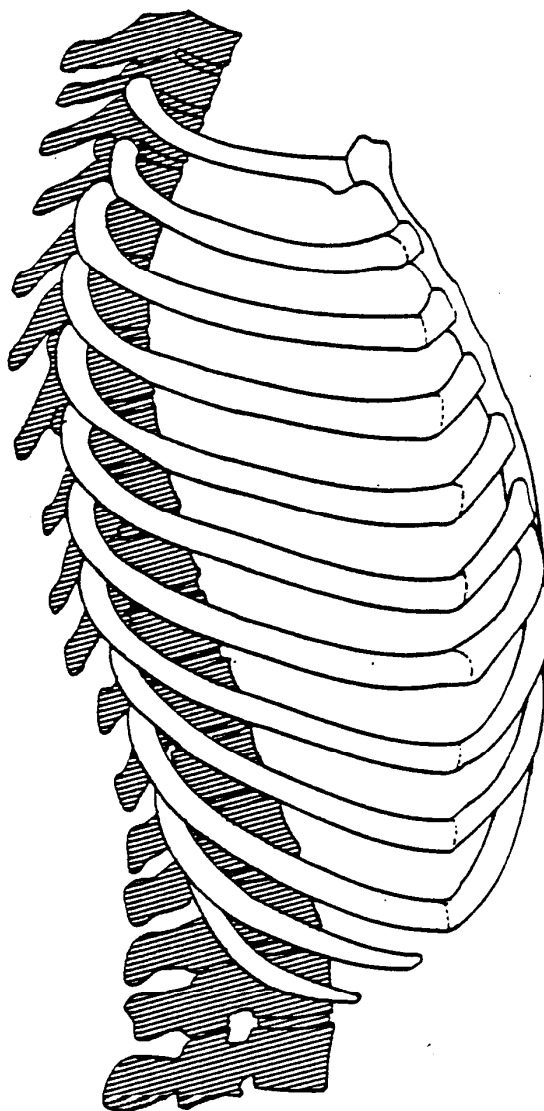
POSTERIOR THORAX



Anterior View

Test No. _____

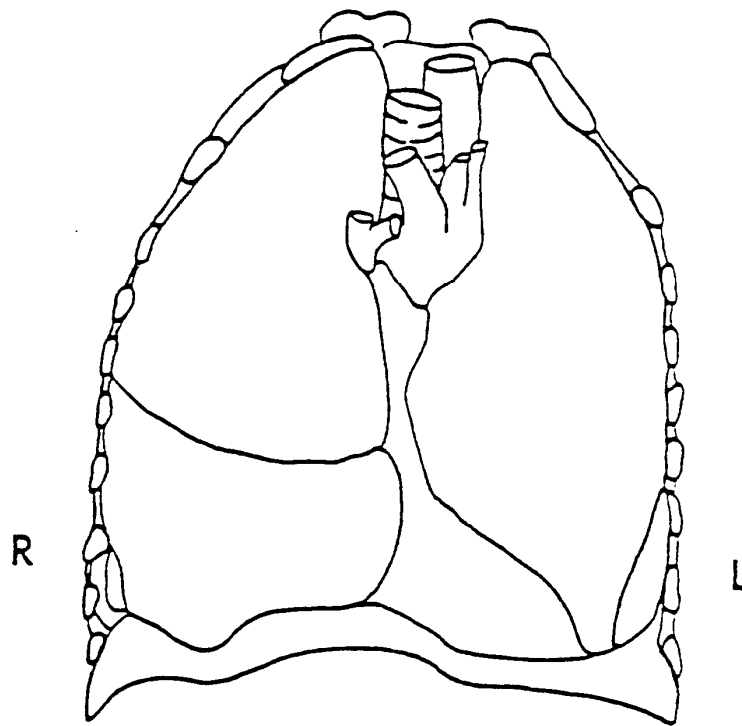
LABORATORY
147



LABORATORY _____

TEST # _____

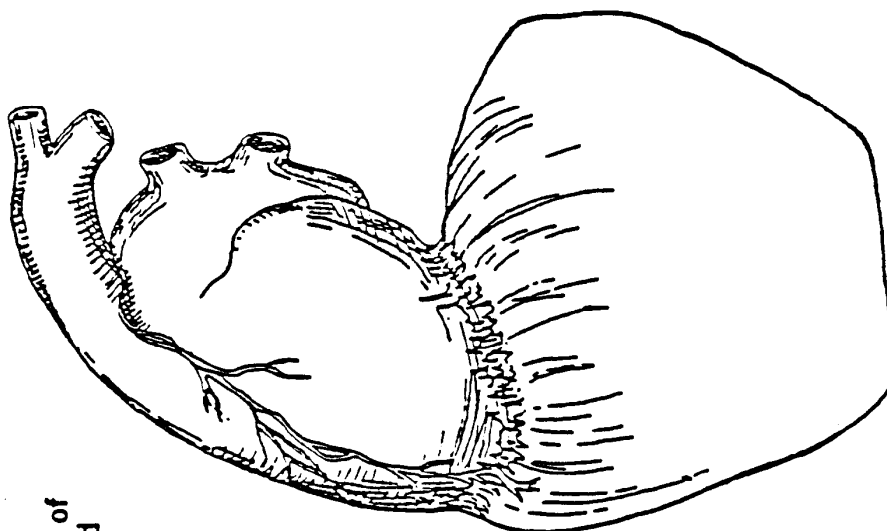
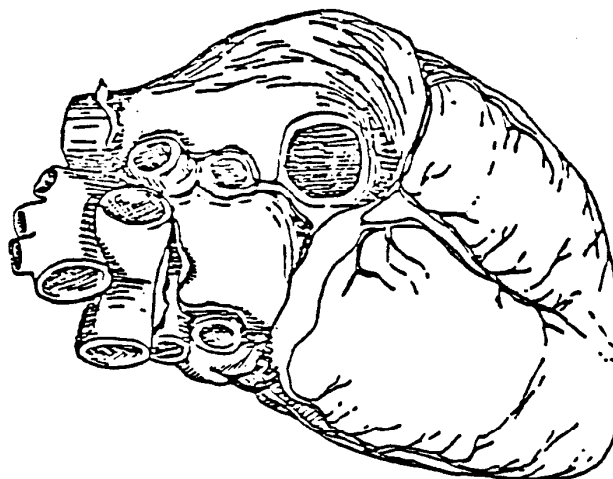
TEST # _____



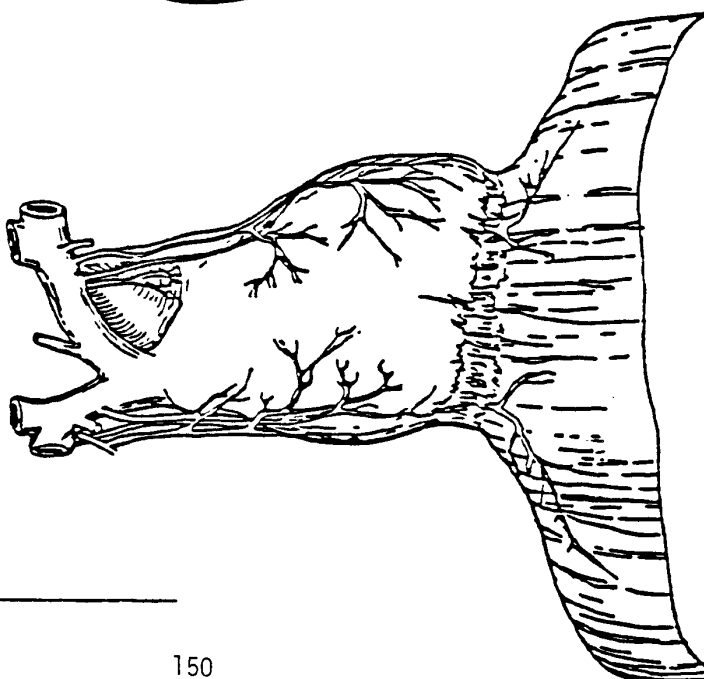
ANTERIOR VIEW THORACIC CAVITY

LABORATORY _____

Diaphragmatic View of Heart



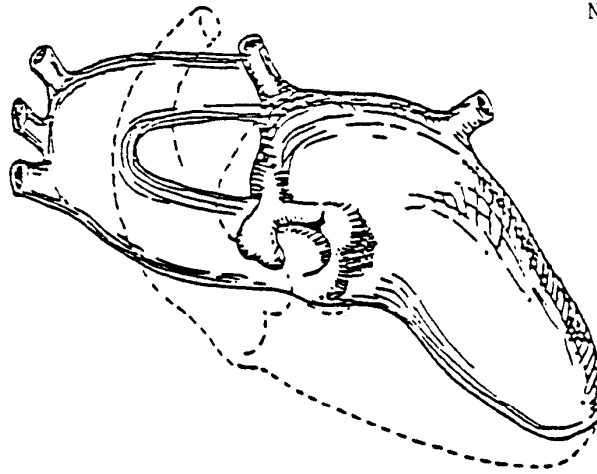
Left Side View of
Pericardium and
Diaphragm



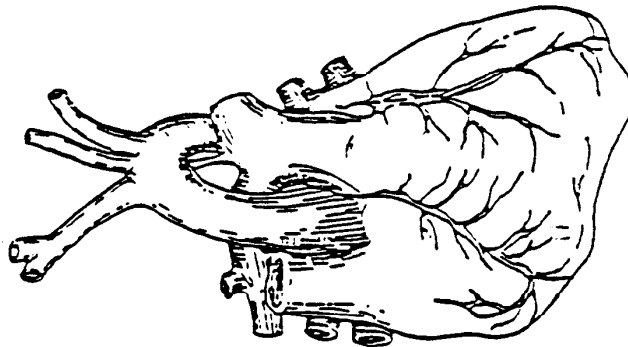
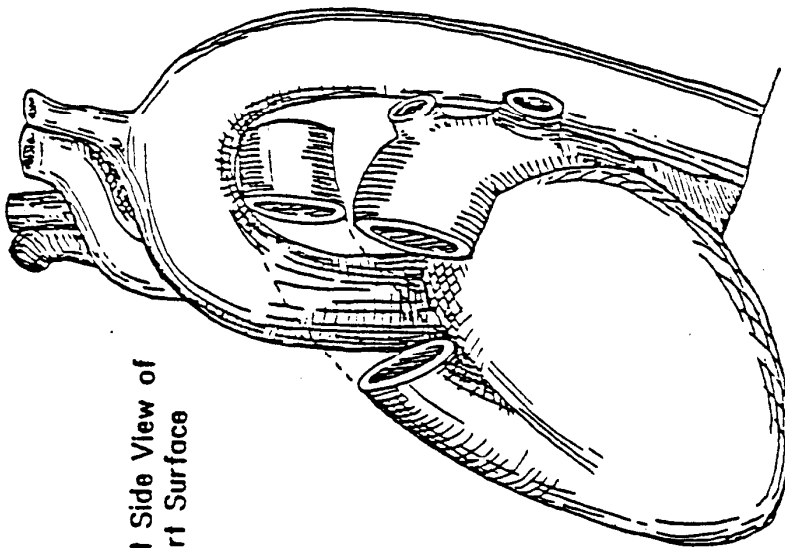
Anterior View of Pericardium and Diaphragm

LABORATORY _____

Left View of Left Side
of Heart

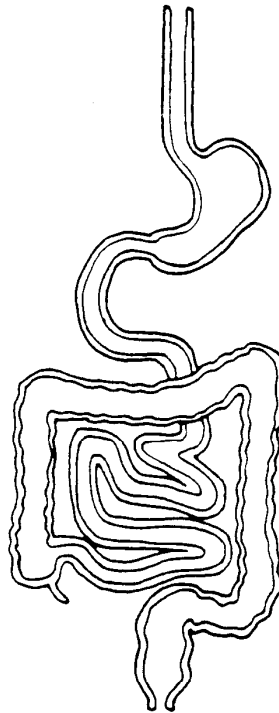


Left Side View of
Heart Surface

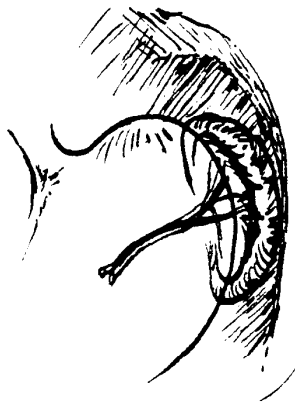


Anterior View of Heart

ALIMENTARY SYSTEM



SPLEEN



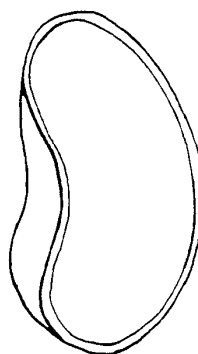
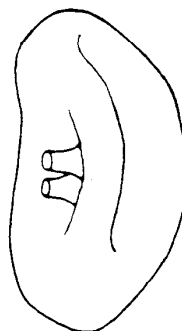
BILIARY SYSTEM



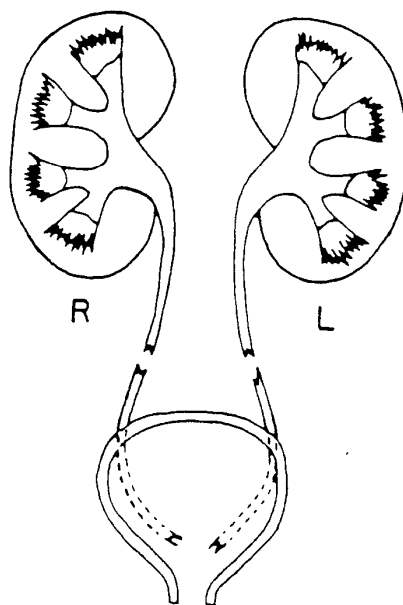
LABORATORY _____

TEST # _____

HEMATOPOIETIC SYSTEM



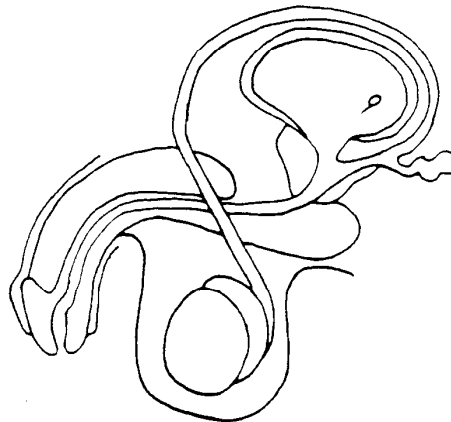
URINARY SYSTEM



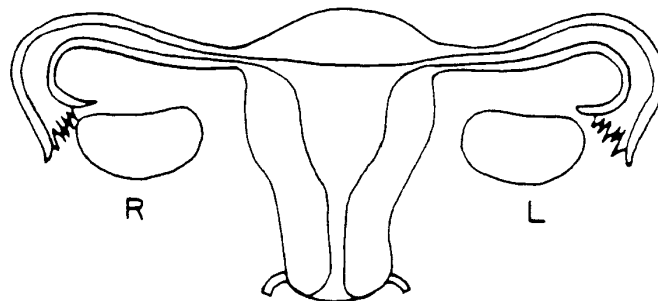
LABORATORY _____ 153

TEST # _____

MALE REPRODUCTIVE SYSTEM



FEMALE REPRODUCTIVE SYSTEM

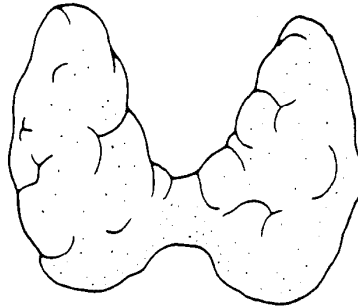


LABORATORY _____

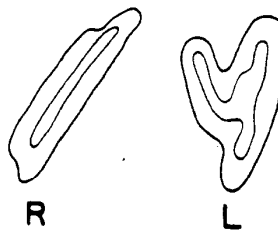
TEST # _____

ENDOCRINE SYSTEM

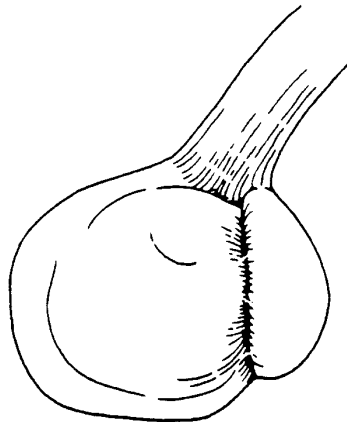
Thyroid



Adrenals

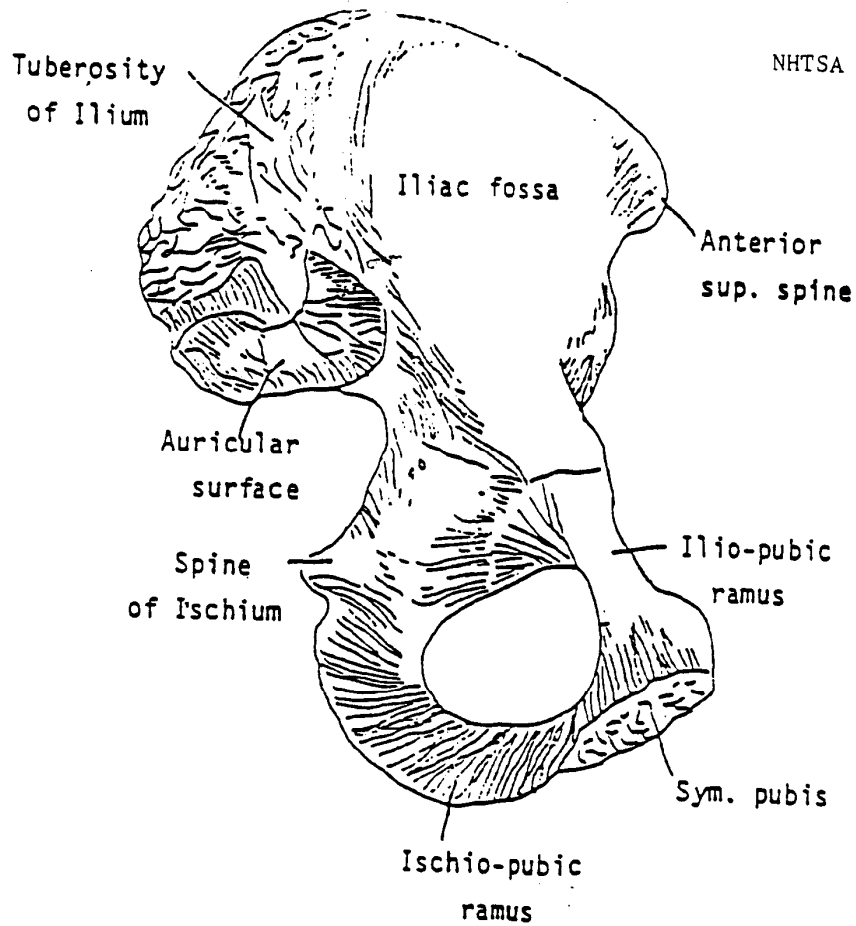


Pituitary



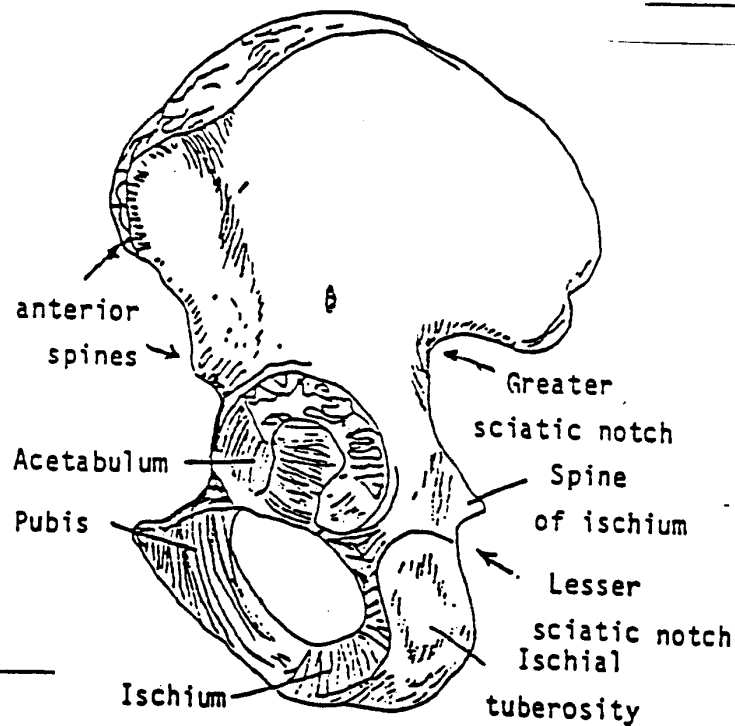
LABORATORY _____

TEST # _____



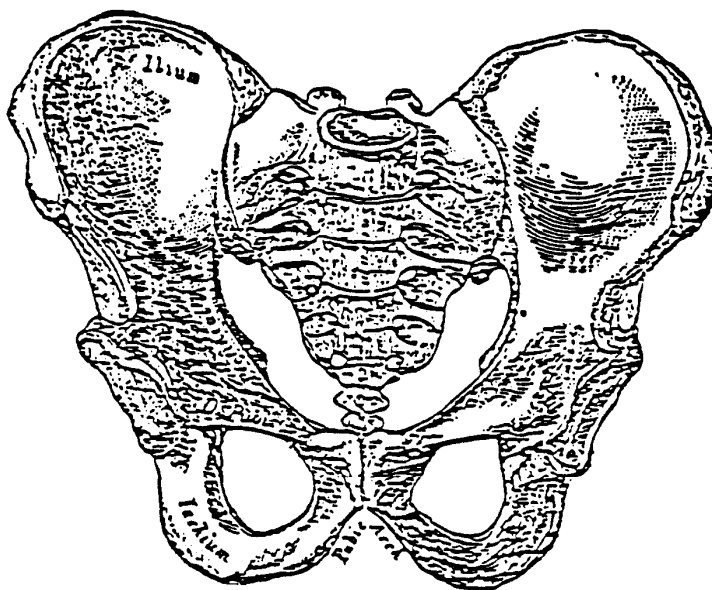
Inner aspect of the left hip bone

LABORATORY _____

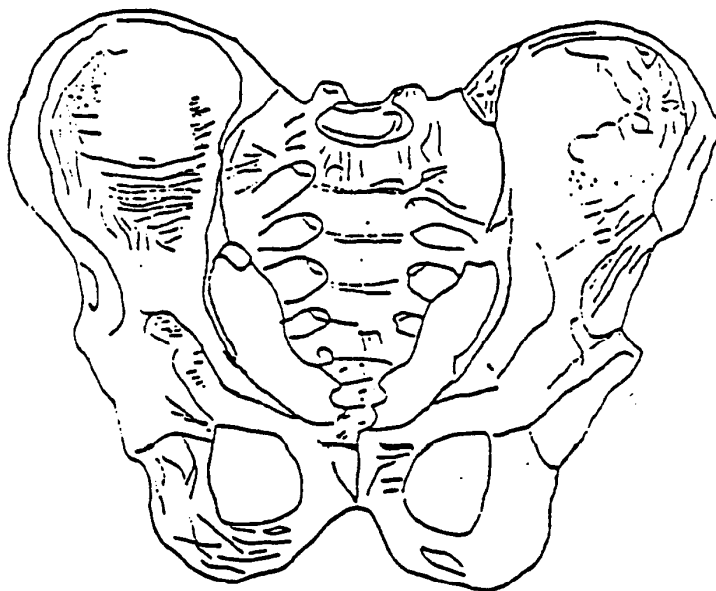


Test No. _____

Outer aspect of the left hip bone



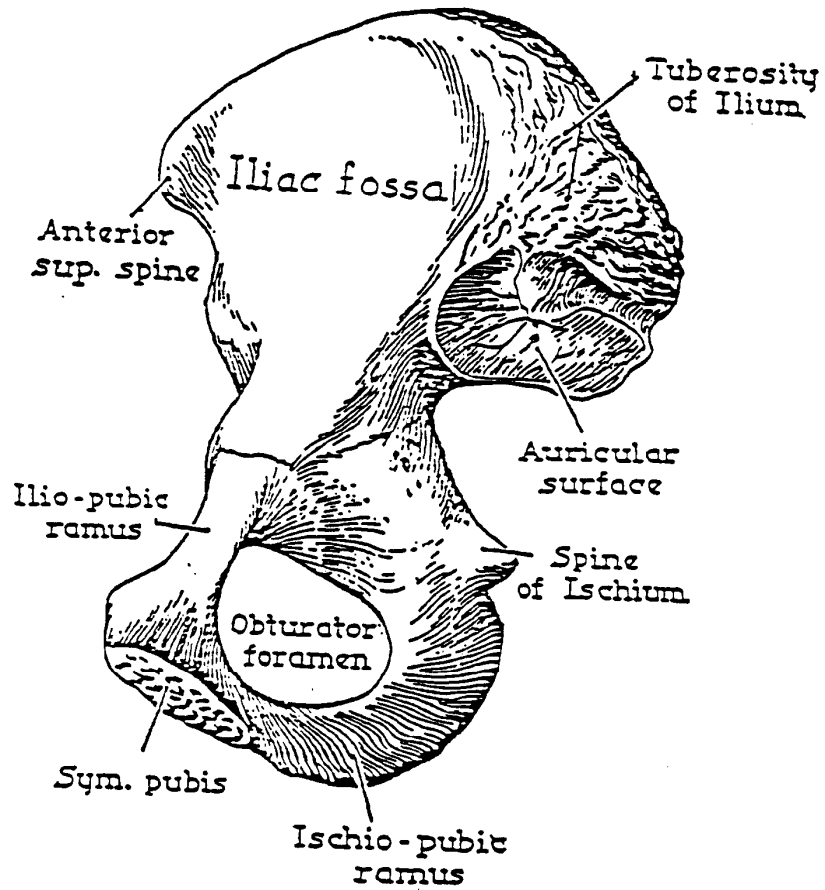
Pelvis - anterior view



Pelvis - posterior view

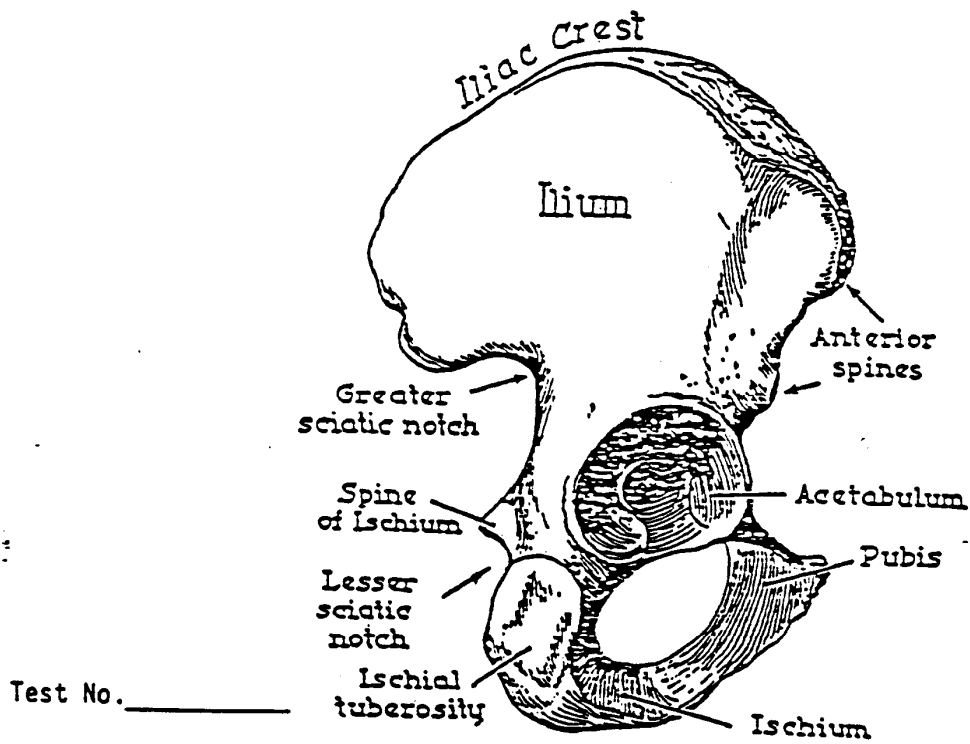
Test No. _____

LABORATORY _____



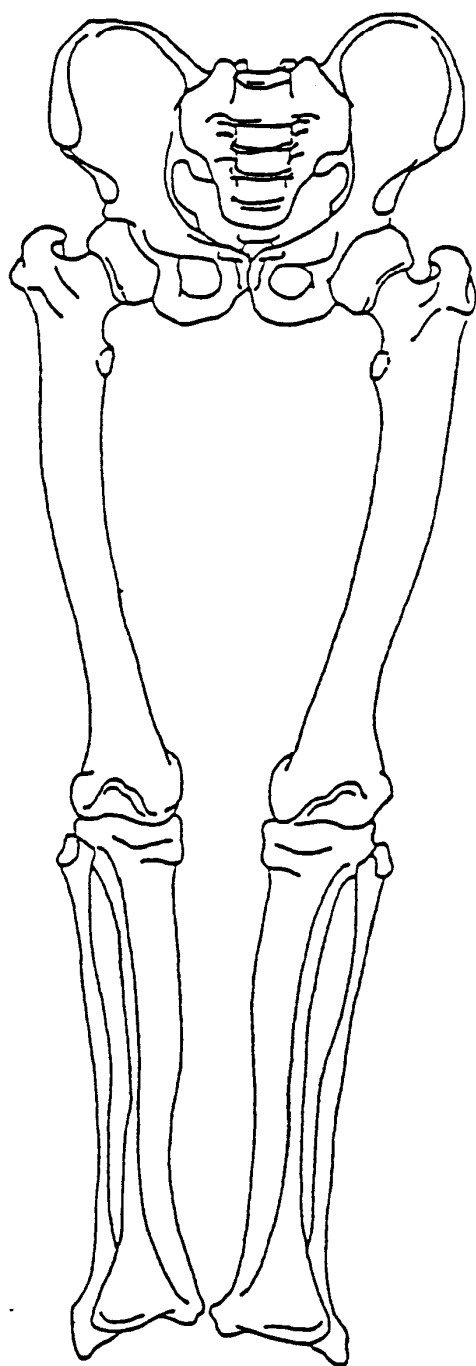
LABORATORY _____

Inner aspect of the right hip bone

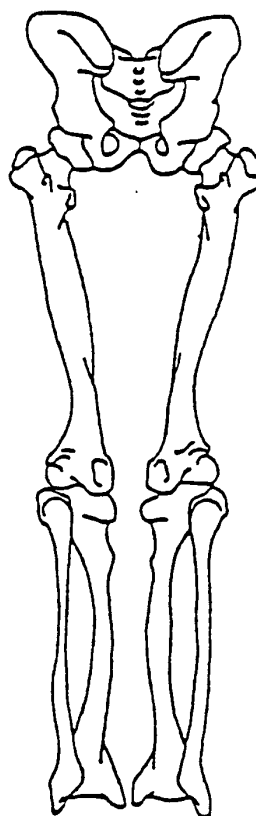


Test No. _____

Outer aspect of right hip bone



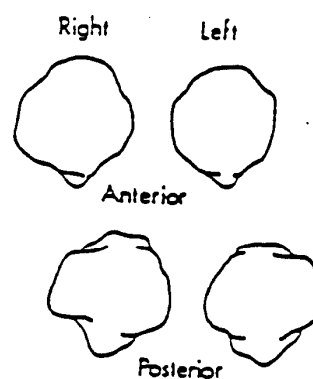
Anterior



Posterior

LOWER EXTREMITIES

PATELLA



Test No. _____

LABORATORY _____

